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David Turner
Utah State University

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A Case Study of Middle School Students' Science Learning

David Jaden Turner jadenturner228@gmail.com, *Utah State University* | Faculty Mentor: Brian R. Belland, *Utah State University*

I. Introduction

To help middle school students become better prepared and more interested in STEM careers, we are attempting to help enable them to form evidence based arguments (EBAs). In our research we investigate how middle school students engage in problem-based learning with the aid of computer-based scaffolding (Hmelo-Silver, 2004; Reiser, 2004; Wood, Bruner, & Ross, 1976).

Problem-based Learning (PBL)

Problem based learning is an instructional approach in which students are exposed to an authentic problem and then develop a solution based upon information they gather (Hmelo-Silver, 2004).

Computer-based Scaffolding

Scaffolding is educational support which assists and sustains students during their learning experience (Wood, Bruner, & Ross, 1976; Reiser, 2004). Computer-based scaffolding helps students organize thoughts and arguments while solving problems (Belland, Glazewski & Richardson, 2008) by providing a basic framework.

II. Method

Research Questions

1. What were the roles of group members?
2. How did middle school students judge the credibility of evidence?
3. How and why did students make sense of data and evidence?
4. How and why did students address the central problem?

Setting and Participants

Participants were students in three class sections of seventh grade science in a rural middle school. Students from two periods were allowed to work with computer-based scaffolding, while students from the remaining period served as a control (they completed the same PBL activities but without the support of computer-based scaffolds). All students had access to water quality data that they had taken, and various online resources.

Procedure

Three-week problem-based learning unit on water quality of a local river. Students

- Performed water quality tests (e.g., pH) along the river
- Compared data to historical data and determined
- sources of any pollution increases
- Recommended solutions from stakeholder position
- Presented their solutions to the county commissioner

Data Collection

Groups were videotaped during the unit, the presentation, and post-unit interview. The researchers transcribed, coded and analyzed the video data from the perspective of ethnomethodology, according to which individuals construct order in their interactions with others, and it is the goal of research to uncover that order (Garfinkel, 1967).

III. Results/Conclusions

The control group represented farmers. The group would often focus on off-topic conversations and thus, were only semi-successful in proposing a solution to the water quality issue. While they did address the water quality they mostly abandoned their stakeholder position. They also were unable to accurately judge the credibility and relevance of evidence, accepting most sources as fact, lest challenged by a teacher.

For More Information:

http://itls.usu.edu/~bbelland/grants/career.php

References

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